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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/629,821	07/30/2003	John Carney	P69049US0	7289

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EXAMINER	
ATKINS, MARK ARMAND	

ART UNIT	PAPER NUMBER
2129	

DATE MAILED: 08/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/629,821	CARNEY, JOHN	
	Examiner	Art Unit	
	Mark A. Atkins	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☒ Claim(s) *1-4,6,9,13 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *Detailed Office Action*.

Examiner's Detailed Office Action

1. This Office Action is responsive to application 10/629,821, filed July 30, 2003.

2. Claims 1-15 have been examined.

Specification Objections

3. Page 6, line 26, states that Fig. 1 is a "representative example" of a neural network. However, the figure shows a specialized neural network that has only one output, whereas neural networks generally can have multiple outputs.

Page 13, line 27, refers to "step 31," which doesn't exist in any of the figures.

Claim Objections

4. The disclosure is objected to because of the following informalities:

Claim 1 is objected to because the word "stage" is not defined in the claims, and it is not clear if this term refers to a physical stage or a temporal stage. Also, in step (c), the phrase "training a subsequent ensemble" is not clear as to whether the subsequent ensemble can be the same as the ensemble in the first stage. Also in step (c) the phrase "using the performance error value" does not specify how that value is being used in conjunction with the ensemble, such as in allowable error, in ensemble selection, or other. Also, in step (g), the phrase "combining all of the ensembles at their outputs" does not specify if that combination means a physical combination,

data combination, functional combination, or other, and this issue is not clarified by later steps or claims.

Claims 2, 4, and 6 are objected to because they refer to "bootstrap training vectors" that are never described or defined in the claims.

Claims 2 and 3 are objected to because they contain parenthesized numbers (20) and (32) that are not defined, and could not refer to claim numbers, diagram numbers, or paragraph numbers. It is assumed these numbers refer to items within the figures, but this should be made clear.

Claim 13 is objected to because the word "predication" is probably intended to be "prediction," if it is to be logical and consistent with the other claims.

Claim 14 is objected to because the term "development system" is not defined, and it is not clear if such a system is computer hardware, computer software, both, or neither.

Claims 3-9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

5. Claims 1-15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. No physical embodiment or implication of physical embodiment is given in these claims, and no specific application is given in the claims. Specifically, claims 1-12 refer only to a "method," claim 12 refers to a "model," which could mean a mathematical model, claim 14 refers to a "development system," and claim 15 refers to a "computer program product" without specifying whether that product is computer hardware, computer software, both, or neither.

6. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

7. The invention as disclosed in claim 1 is rejected under 35 U.S.C. 101 as being non-statutory subject matter. While applicant's invention is directed towards technological arts. Applicant's claim language is not limited to practical applications. In particular, examiner has found the claimed subject matter, to be one of three exclusions recognized, outside the statutory category of invention, an abstract idea. Examiner contends that applicant's invention as claimed relates a computational model or a mathematical manipulation of a function or equation, as such, a process that merely manipulates an abstract idea or performs a purely mathematical algorithm is nonstatutory despite the fact that it might inherently have some usefulness. In Sarkar, 588 F.2d at 1335, 200 USPQ at 139, the court explained why this approach must be followed:

> No mathematical equation can be used, as a practical matter, without establishing and substituting values for the variables expressed therein. Substitution of values dictated by the formula has thus been viewed as a form of mathematical step. If the steps of gathering and substituting values were alone sufficient, every mathematical equation,

> formula, or algorithm having any practical use would be per se subject to patenting as a "process" under 101. Consideration of whether the substitution of specific values is enough to convert the disembodied ideas present in the formula into an embodiment of those ideas, or into an application of the formula, is foreclosed by the current state of the law.

Furthermore, for such subject matter to be statutory, the claimed process must be limited to a practical application of the abstract idea or mathematical algorithm in the technological arts. *See* Alappat, 33 F.3d at 1543, 31 USPQ2d at 1556-57 (quoting Diamond v. Diehr, 450 U.S. at 192, 209 USPQ at 10). *See* also Alappat 33 F.3d at 1569, 31 USPQ2d at 1578-79 (Newman, J., concurring) ("unpatentability of the principle does not defeat patentability of its practical applications") (citing O'Reilly v. Morse, 56 U.S. (15 How.) at 114-19). A claim is limited to a practical application when the method or system, as claimed, produces a concrete, tangible and useful result; i.e., the method recites a step or act of producing something that is concrete, tangible and useful. *See* AT &T, 172 F.3d at 1358, 50 USPQ2d at 1452. *See* MPEP § 2106(IV) Applicant is advised to make the appropriate corrections in an attempt to gain patentability. The claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." *State Street*, 149 F.3d at 1373, 47 USPQ2d at 1601-02. Remember, the claims define the property rights provided by a patent, and thus require careful scrutiny. Therefore, it is not enough to set forth invention in the specification. The claims must also reflect the scope and breath of applicant's invention.

8. It should be noted that if the claimed subject matter were amended to recite the invention of which, being implemented on a computer or processor or computer-implemented method or process or whatever word(s) or phrase(s) the written description of the specification recites for that feature(s) of the computer. The rejection under 35 USC § 101 would be withdrawn.

Moreover, if assistance is required or applicant would like to request a telephone interview, examiner may be reached at the contact information listed below.

To expedite a complete examination of the instant application the claims rejected under 35 U.S.C. 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Hansen et al.* (Lars Kai Hansen and Peter Salamon, "Neural Network Ensembles," 1990) in view of *Franklin et al.* (Gene F. Franklin, J. David Powell, and Michael Workman, *Digital Control of Dynamic Systems*, 1997) and *Carney et al.* (John G. Carney and Padraig Cunningham, "Confidence and prediction intervals for neural network ensembles," 1999).

Regarding claim 1. *Hansen et al.* teaches a method of generating a neural network prediction model [*see* Introduction, paragraph 3. *Examiner interprets "training the network" to include "generating a neural network prediction model."*], the method comprising the steps of: in a first

stage: (a) training an ensemble of neural networks [*see* Introduction, paragraph 4], and (b) estimating a performance error value for the ensemble; in a subsequent stage [*see* section V.B., paragraph 1. *Examiner interprets a formula for "performance of an ensemble of neural networks" to be "estimating a performance error value for the ensemble."*]: (c) training a subsequent ensemble of neural networks, using the performance error value for the preceding ensemble [*see* Abstract. *Examiner interprets "invoking ensembles of similar networks" to include "training a subsequent ensemble of neural networks."*]; (d) estimating a performance error value for a combination of the current ensemble and each preceding ensemble [*see* Abstract, and section V.B., paragraph 1. *Examiner interprets "estimating a performance error value for a combination" of ensembles to be covered by a performance formula in conjunction with "invoking ensembles of similar networks."*]; (g) combining all of the ensembles at their outputs to provide the prediction model [*see* section V, paragraph 1. *Examiner interprets "can make a collective classification" via different voting rules to be functionally equivalent to "combining all of the ensembles at their outputs."*].

Hansen et al. does not teach (e) determining if the current performance error value is an improvement over the preceding value; and (f) successively repeating steps (c) to (e) for additional subsequent stages until the current performance error value is not an improvement over the preceding error value. However, *Franklin et al.* describes the Kalman filter algorithm as "combining the previous estimate with the current measurement based on the relative accuracy of the two quantities" [*see* p. 390, paragraph 1; *Examiner interprets the Kalman filter algorithm as determining performance error and minimizing that error based on preceding values, and that*

an "estimate" is a type of "value."]; the filter with zero gain will drift away from reality and is referred to as a divergent filter [*see* p. 393, paragraph 2. *Examiner interprets "drift away from reality" as a state wherein "current performance error is not an improvement."*]. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to combine *Hansen et al.* with *Franklin et al.* because both the Kalman filter and artificial neural networks are both used in estimation, modeling, and prediction, and the neural network literature contains numerous references to Kalman filters as methods for pruning and designing neural networks, as in the book *Kalman Filtering and Neural Networks* (Simon Haykin, 2001). The Kalman filter itself was invented by R.E. Kalman and dates back to 1960.

Regarding claim 2. *Carney et al.* teaches a method as claimed in claim 1, wherein the step (a) (20) is performed with bootstrap resampled training sets derived from training sets provided by a user, the bootstrap resampled training sets comprising training vectors and associated prediction targets [*see* Abstract. *Examiner interprets "technique that uses the bootstrap to estimate confidence and prediction intervals for neural network (regression) ensembles" to include "training an ensemble of neural networks," especially since specific experimental results of training were described later in the reference.*].

Regarding claim 10. *Carney et al.* teaches a method as claimed in claim 1, wherein steps (c) to (e) are not repeated above a pre-set limit number (S) of times [*see* section IV, paragraph 2.

Examiner interprets the absence of sequential stages of ensemble learning to mean that S=1 in the cited experiment, therefore the steps were not repeated above the preset limit of S=1 times.].

Regarding claim 11. *Carney et al.* teaches a method as claimed in claim 1, wherein the step (c) is performed with a pre-set upper bound (E) on the number of iterative weight updates [*see* section IV, paragraph 2. *Examiner interprets the absence of sequential stages of ensemble learning to mean that E=1 in the cited experiment, therefore the steps were preformed with the preset upper bound of E=1 times.*].

Regarding claim 12. *Carney et al.* teaches a method as claimed in claim 1, wherein the method is performed with a pre-set upper bound on the number of networks in the ensembles [*see* section III, paragraph 5. *Examiner interprets "a large number of bootstrap networks for the ensemble (we use 200, but fewer would suffice)" to imply a preset upper bound of 200 networks in the ensembles.]*.

Regarding claim 13. *Carney et al.* teaches a prediction model whenever generated by a method as claimed in claim 1 [*see* Abstract. *Examiner interprets the use of prediction intervals for estimating "model uncertainty" as implying a "prediction model."*].

Regarding claim 14. *Hansen et al.* teaches a development system comprising means for performing the method of claim 1 [*see* section II, paragraph 1. *Examiner interprets "we employ a database" in investigating ensembles as implying that a type of "development system" for performing the described methods was used.*].

Regarding claim 15. *Hansen et al.* teaches a computer program product comprising software code for performing a method as claimed in claim 1 when executing on a digital computer [*see* section II, paragraph 1. *Examiner interprets "a database" for investigating ensembles as a type of "computer program product" for performing the described methods on a digital computer.*].

Correspondence Information

11. Any inquiries concerning this communication or earlier communications from the examiner should be directed to Mark A. Atkins, who may be reached Monday through Friday, between 8:00 a.m. and 5:00 p.m. EST, or via telephone at (571) 272-5532 or facsimile transmission (571) 273-5532 or e-mail mark.atkins@uspto.gov.

If you need to send an Official facsimile transmission, please send it to (571) 273-8300.

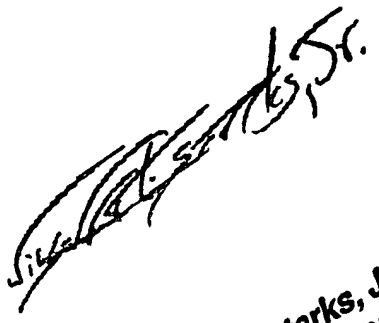
If attempts to reach the examiner are unsuccessful the Examiner's Supervisor, Anthony Knight, may be reached at (571) 272-3687.

Hand-delivered responses should be delivered to the Receptionist @ (Customer Service Window Randolph Building 401 Dulaney Street Alexandria, VA 22313), located on the first floor of the south side of the Randolph Building.

Anthony Knight
Supervisory Patent Examiner
TC 2100

Wednesday, July 18, 2005

MAA



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Art Unit - 2121